DETERMINING THE CRUSTRAL DEFORMATIONS

- Tectonic Structure of Turkey
- GPS Campaigns
- Processing the GPS Observations
- Determining the Velocities
- Strain Analyses

Tectonic Structure of Turkey

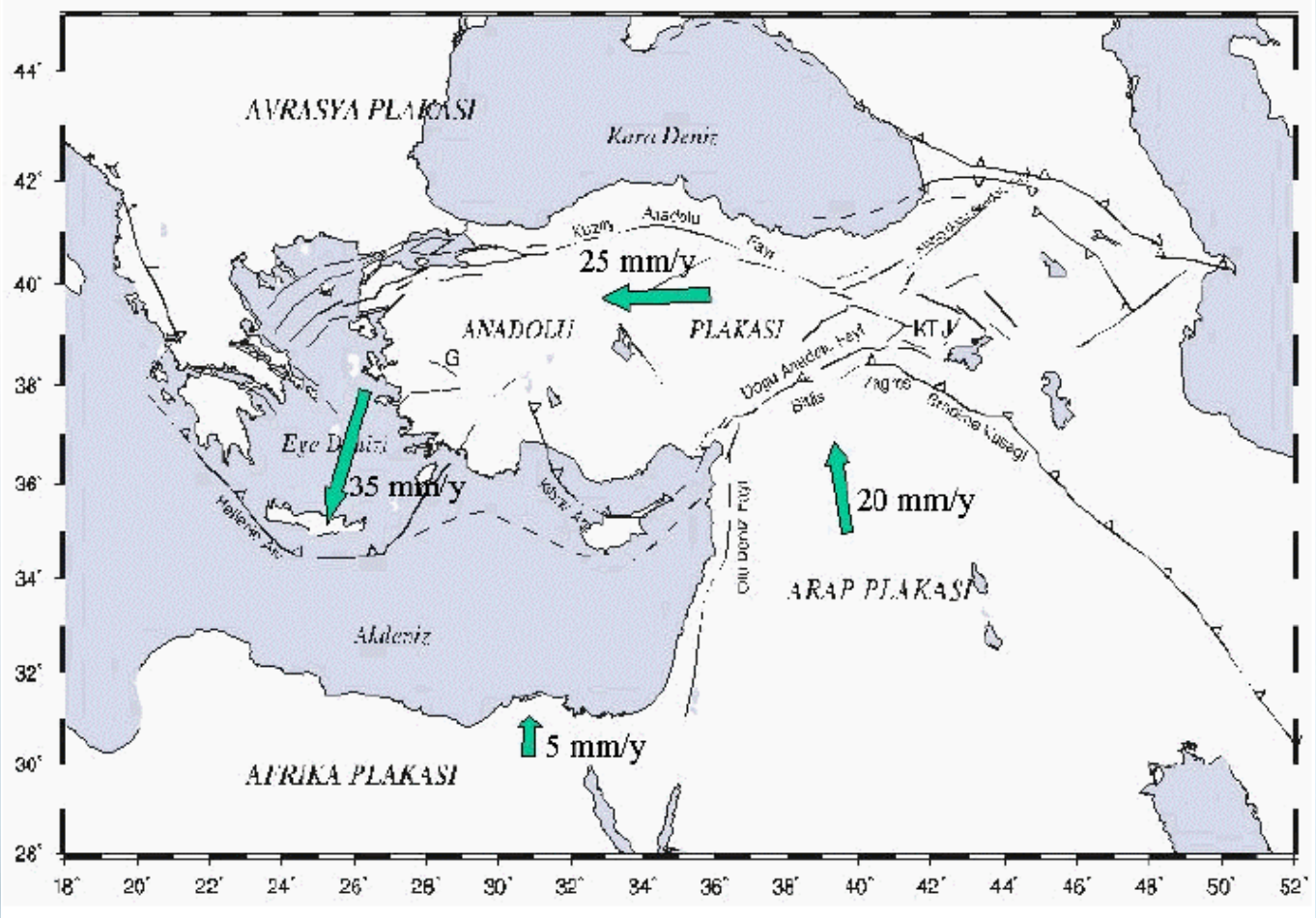


Figure 1. Active Tectonic Map of Turkey (McClusky, vd., 1999)

Tectonic Structure of Turkey

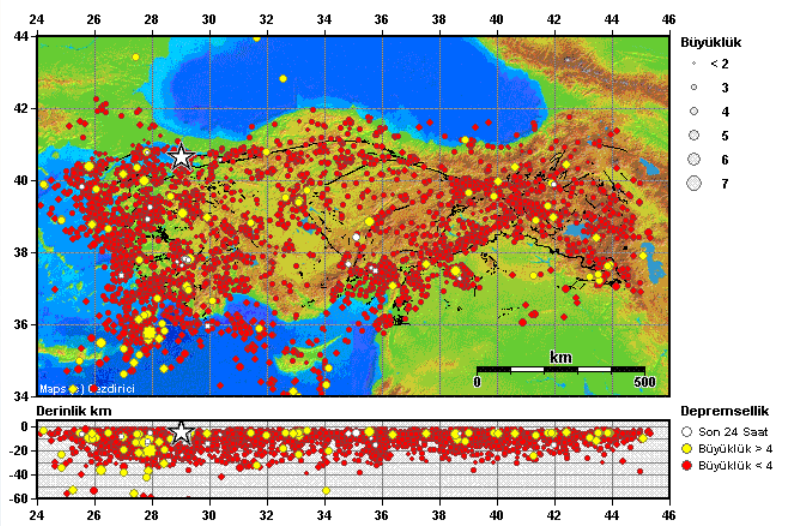


Figure 2. Earthquake locations and magnitudes that occurred last year in Turkey

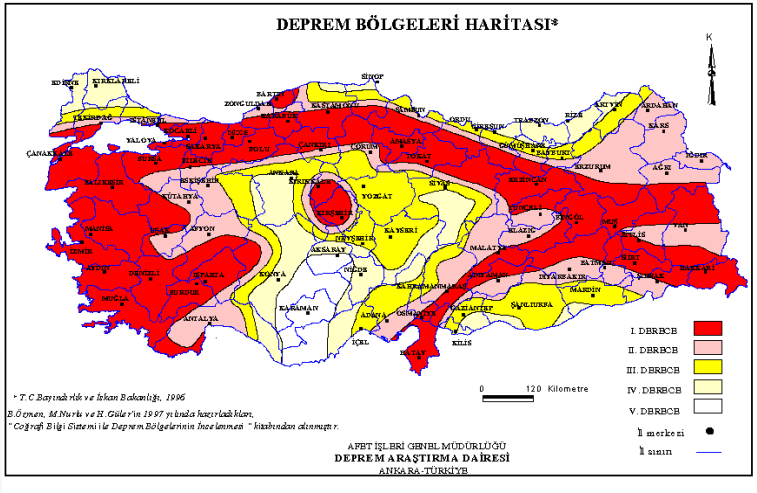


Figure 3. Earthquake Risk Map of Turkey

Tectonic Structure of Turkey

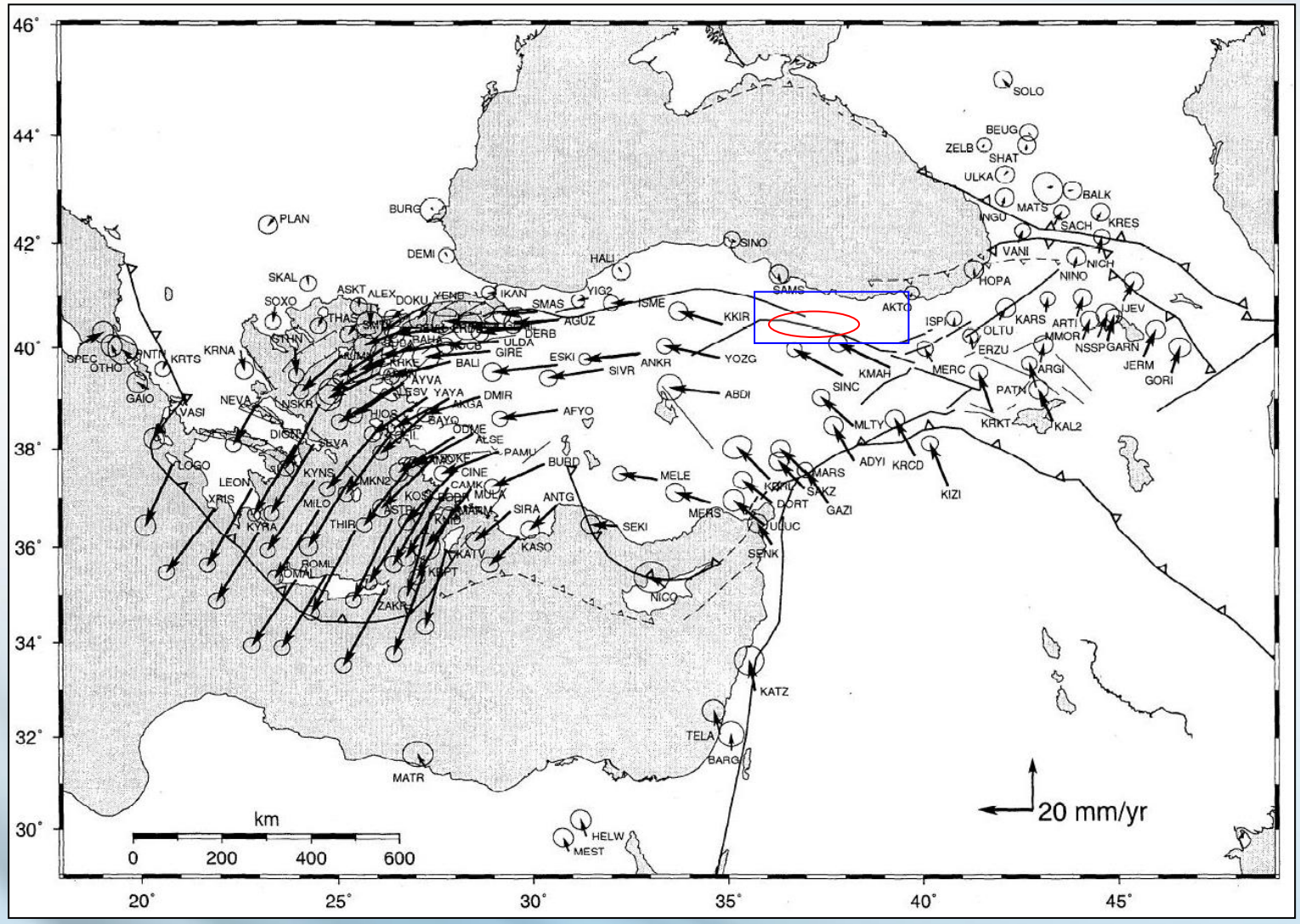


Figure 4.McClusky et al. 2000, GPS Data 1988-1997

Project Area

Figure 5. Project Area

Project Area

Table 1. Population and Area Values of Kelkit and Environment Provinces According to Earthquake Hazard Areas(Tatar vd., 2006)

	1.DERECE	2. DERECE	3.DERECE	4 DERECE
YÜZÖLÇÜM (69.437 Km2)	35.287 Km2 **-51%**	10.413 Km2 -15%	12.563 Km2 -18%	11.167 Km2 -16%
NÜFUS (3.457.000 Kişi)	1.866.000 **54%**	591.000 17%	621.000 18%	378.000 11%

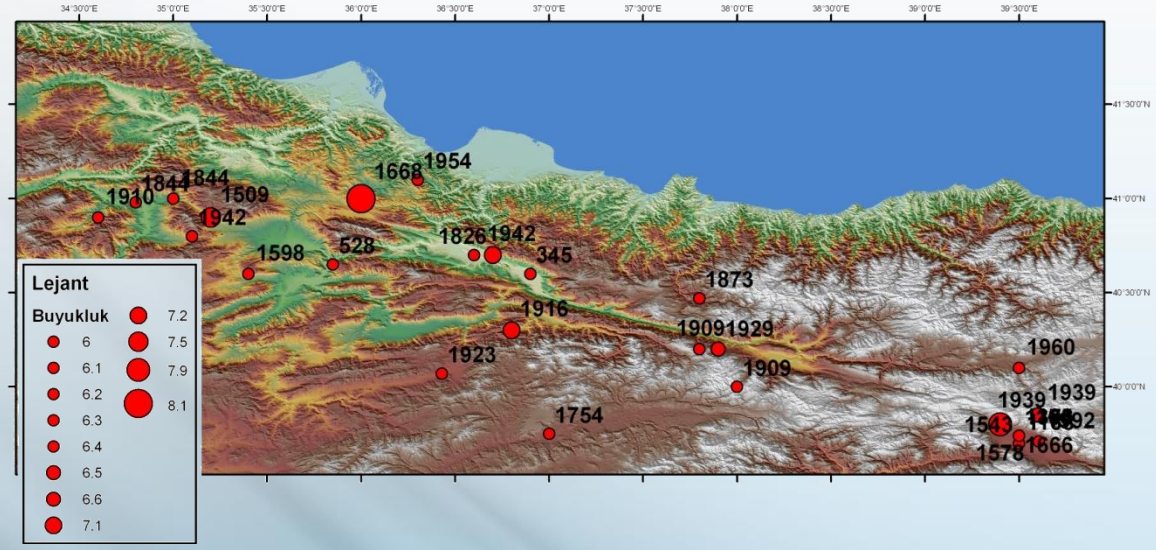


Figure 6. Historical earthquakes in the region(Tatar vd., 2006)

Project Area

Different methods are used for determining the crustral deformations depending on time.

- ~10 years: GPS
- ~10 - 100 years : Earthquake data, stress data, geological investigations
- ~1000 - 100.000 years : geomorphological analysis, river displacement, movement of erosion surfaces etc..
- ~100.000 – 10.000.000 years : paleomagnetic investigation of crustal displacements (Tatar, vd. 2006).

Selection of Test Network

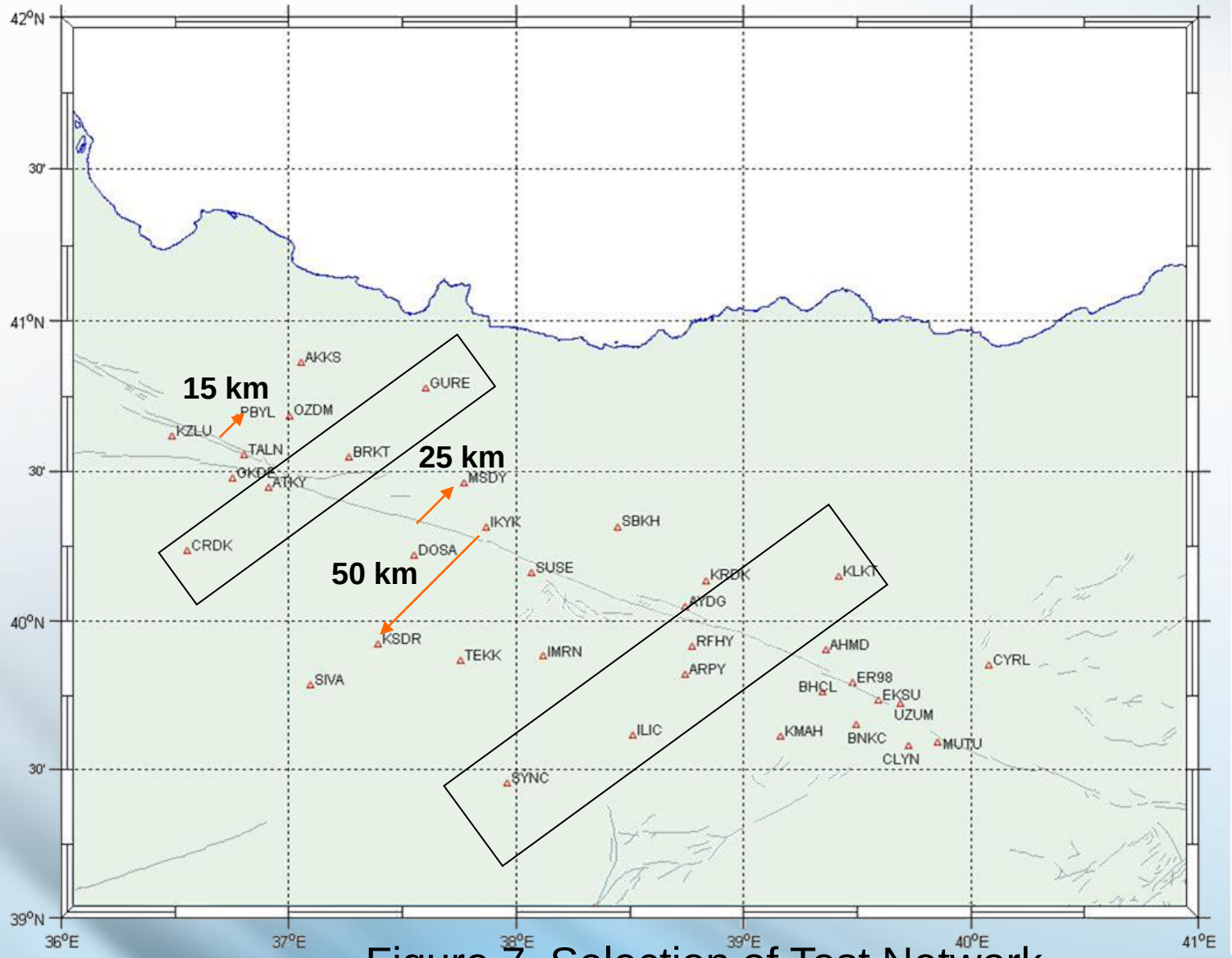


Figure 7. Selection of Test Network

Session Planning

- 36 points on GPS network
- 4 reference points, 32 campaign points
- 24 hours observation on reference points
- 10 hours observation on campaign points (3 days)
- 30 seconds record interval
- 10 degress elevation mask

Figure 8.

Session Planning

Figure 9. a) Pillar b) Chain tripod

Processing the GPS Observations

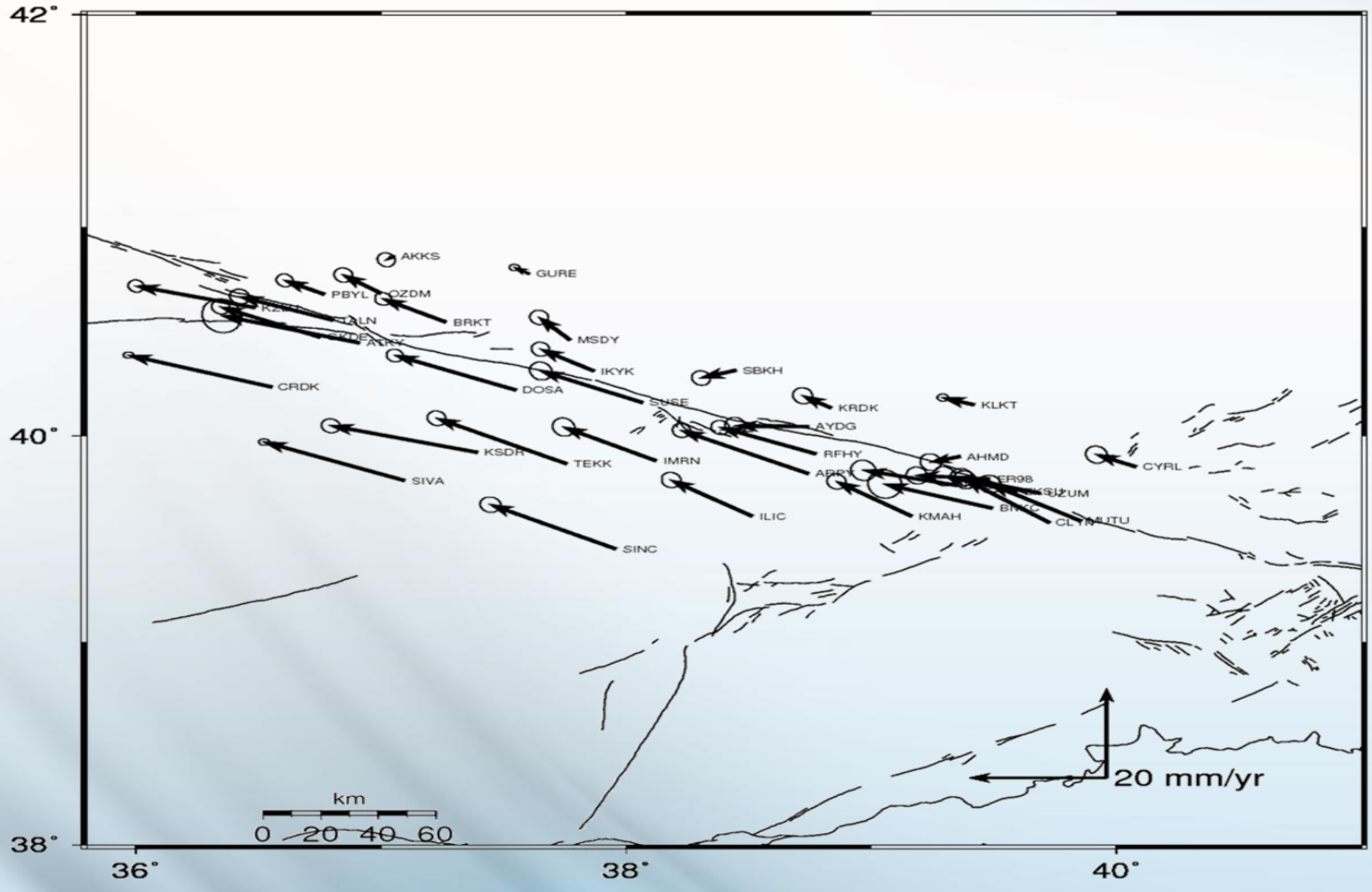
International GPS Service IGS

Processing the GPS Observations

Table 2. IGS reference points

2006 Yılı	2007 Yılı	2008 Yılı	
Nokta Adı	Nokta Adı	Nokta Adı	Noktanın Yeri
TUBI	TUBI	TUBI	Tübitak-Türkiye
MATE	MATE	MATE	Matera-İtalya
SOFI	SOFI	SOFI	Sofia-Bulgaristan
BUCU	BUCU	BUCU	Bucuresti-Romanya
KIT3	KIT3	KIT3	Kitab-Özbekistan
GRAZ	GRAZ	GRAZ	Graz-Avusturya

Determing the Velocities



Determing the Velocities

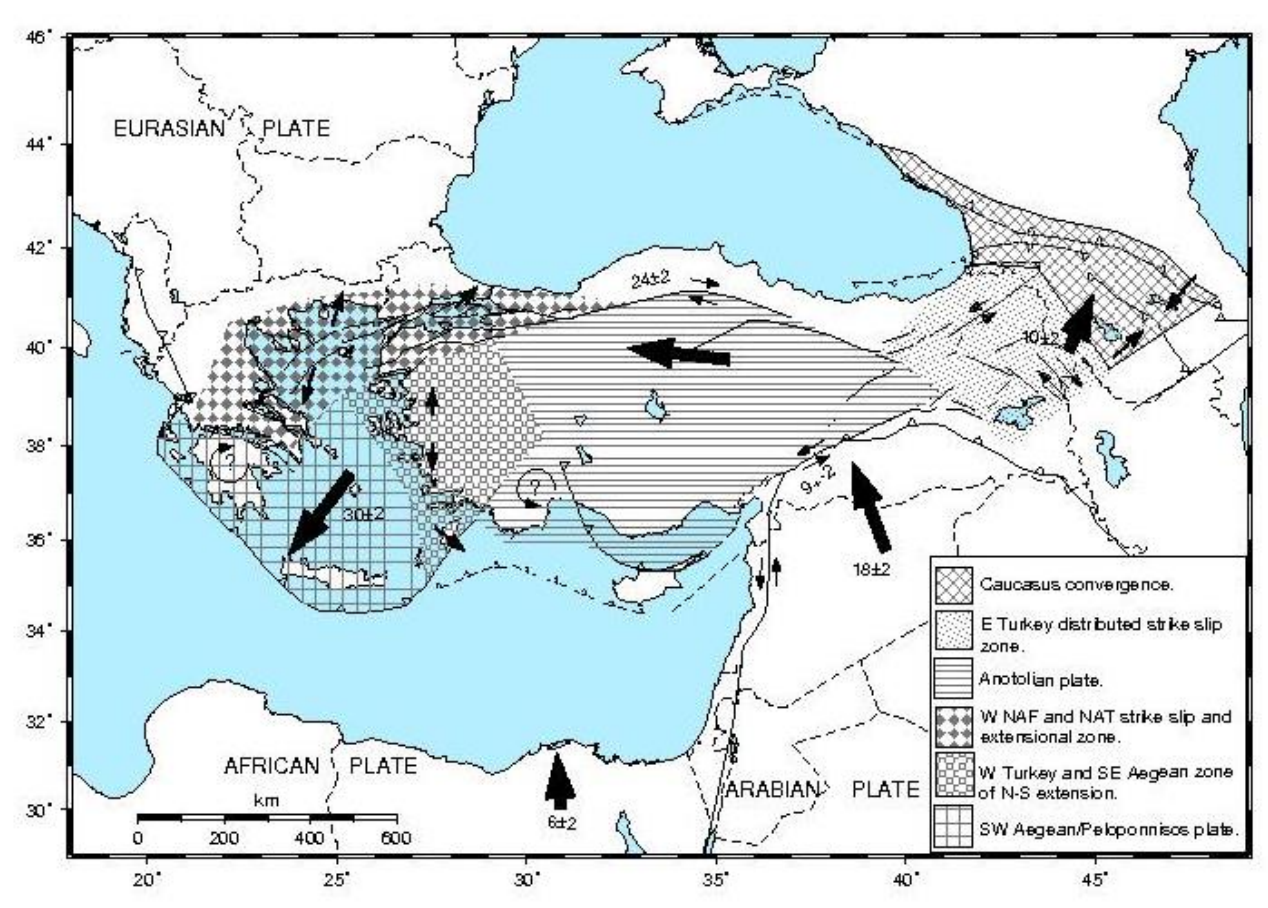


Figure 11. Kinematics of Turkey(Mc Clusky vd. 2000)

Determing the Velocities

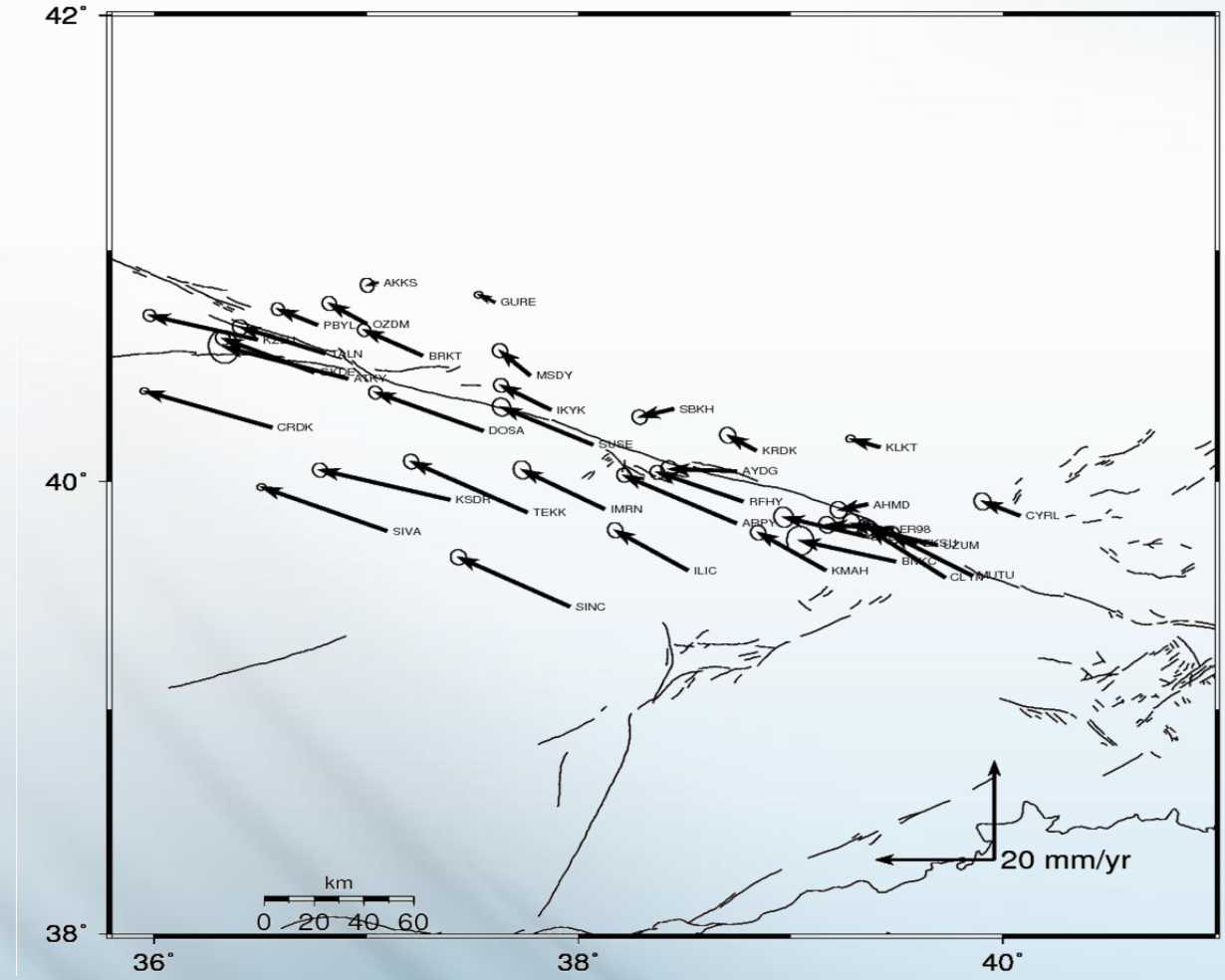


Figure 12. Velocity vectors by the Eurasian Plate in the ITRF05 System

Strain Analysis for Single Block Model Applied in Test Area

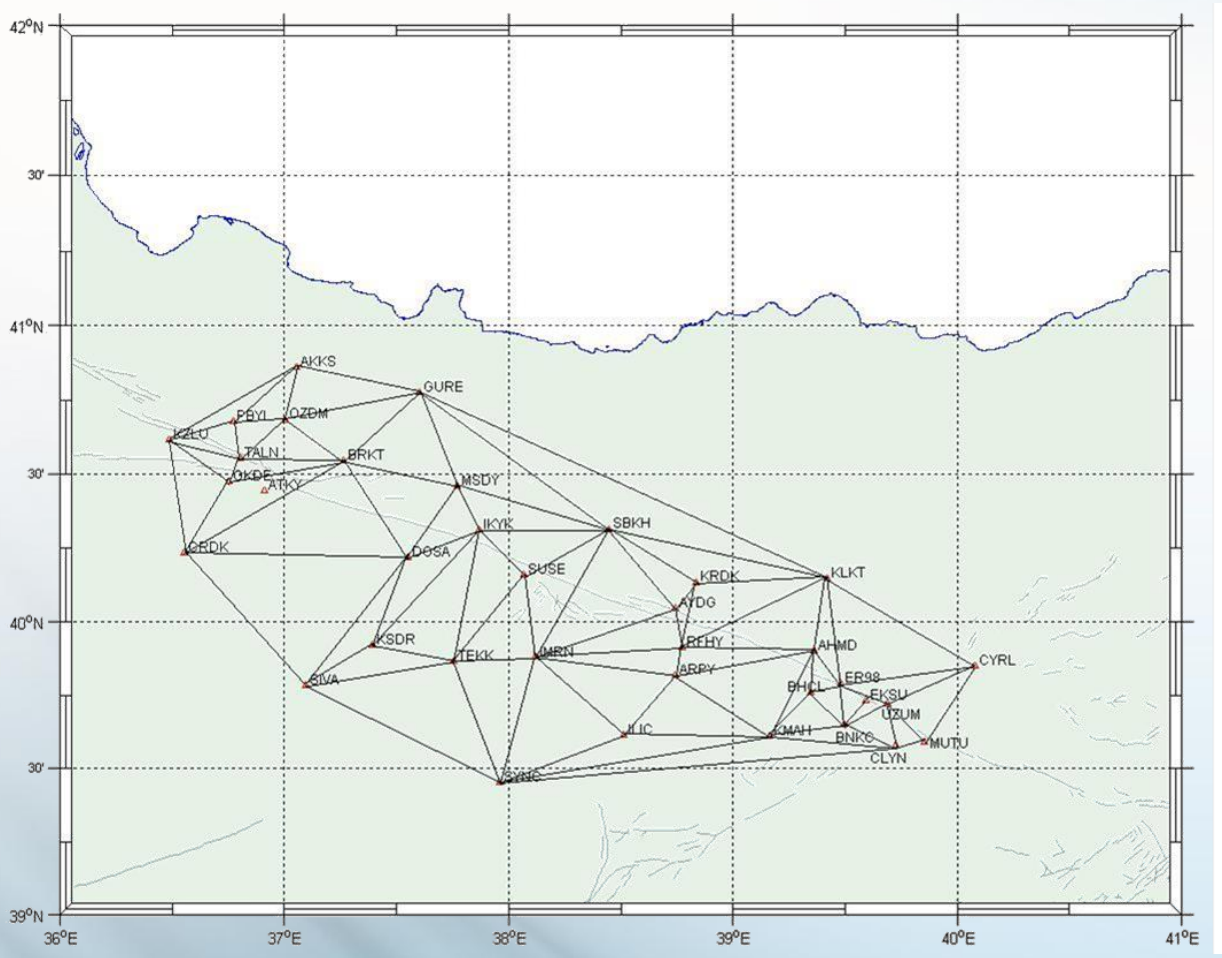
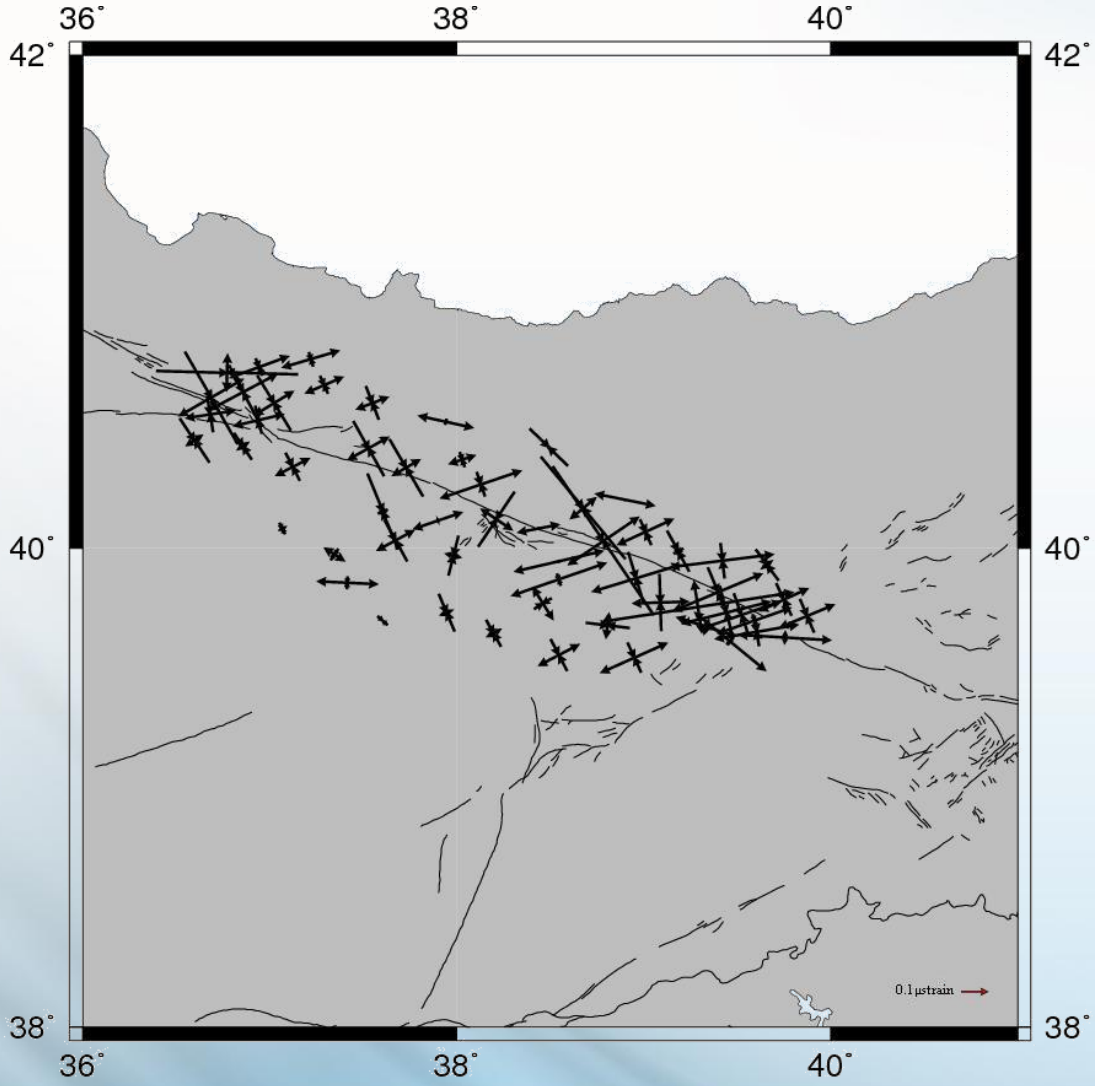


Figure 13. Triangles in the Kelkit GPS network used to calculate strain parameters for a single block

Strain Analysis for Single Block Model Applied in Test Area



Strain Analysis for Single Block Model Applied in Test Area

Table 3. Strain parameters obtained for three sub-regions (for one block)

Bölge Adı	Enlem (º)	Boylam (º)	E1 (μs)	E2 (μs)	Beta (Grad)
Tokat	40.542	37.008	0.396	-0.436	-16.717
Sivas	40.059	38.084	0.353	-0.290	-9.638
Erzincan	39.774	39.306	0.670	-0.324	-17.417

Table 4. Strain parameters for lower zones (for two blocks)

Bölge Adı	Enlem (º)	Boylam (º)	E1 (μs)	E2 (μs)	Beta (Grad)
Tokat Kuzey	40.64	37.27	0.37	-0.29	-25.11
Sivas Kuzey	40.32	38.40	0.35	-0.34	-15.33
Erzincan Kuzey	39.95	39.37	0.48	-0.55	-19.16
Tokat Güney	40.37	36.97	0.31	-0.26	-21.77
Sivas Güney	39.87	37.92	0.26	-0.20	-0.54
Erzincan Güney	39.67	39.07	0.59	-0.21	-4.63